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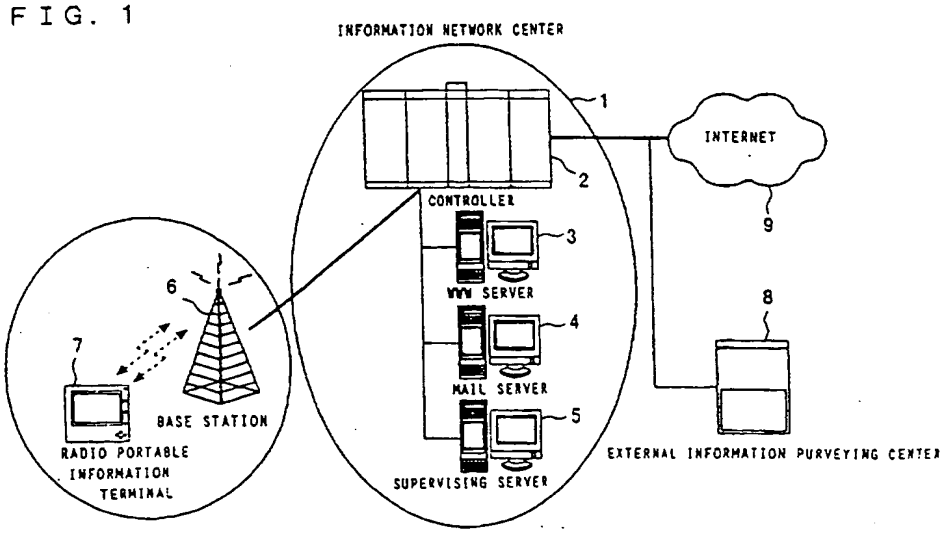
(54) Abstract Title
Portable radio information terminal and data transmitting/receiving system

(57) In a portable radio information terminal 7, if both the present level of the battery capacity and the level of received signal strength are above respective thresholds at which data communication is possible, the portable terminal 7 sends a data transmission/reception possible or enabling signal via a base station 6 to a supervising server 5 in an information network centre 1. If the battery level is below the data communication threshold, the terminal 7 sends a data transmission/reception impossible or disabling signal to the server 5. The terminal 7 also sends the impossible/disabling signal if the received signal strength is below the data communication threshold.. A display (19. Fig.2) on the terminal may indicate whether data communication is possible or impossible. Data is not sent from the centre 1 to the portable terminal 7 unless the server 5 has received the data transmission/ reception possible signal from terminal 7. This avoids having to re-transmit data from the centre 1 in circumstances where the terminal 7 would initially not be able to receive it. The terminal 7 may send a specified time signal when data communication is to be made within a specified time, checking of battery level and received signal strength, and the resultant sending of the data transmission/reception possible signal or impossible signal, then being done when a specified time acceptance signal is received by terminal 7 from the centre 1 or when the specified time signal has been sent from the terminal 7 for a certain number of times without a specified time acceptance signal being received from the centre 1 (Figs.8-10).

FIG. 1



GB 2 337 423 A

FIG. 1

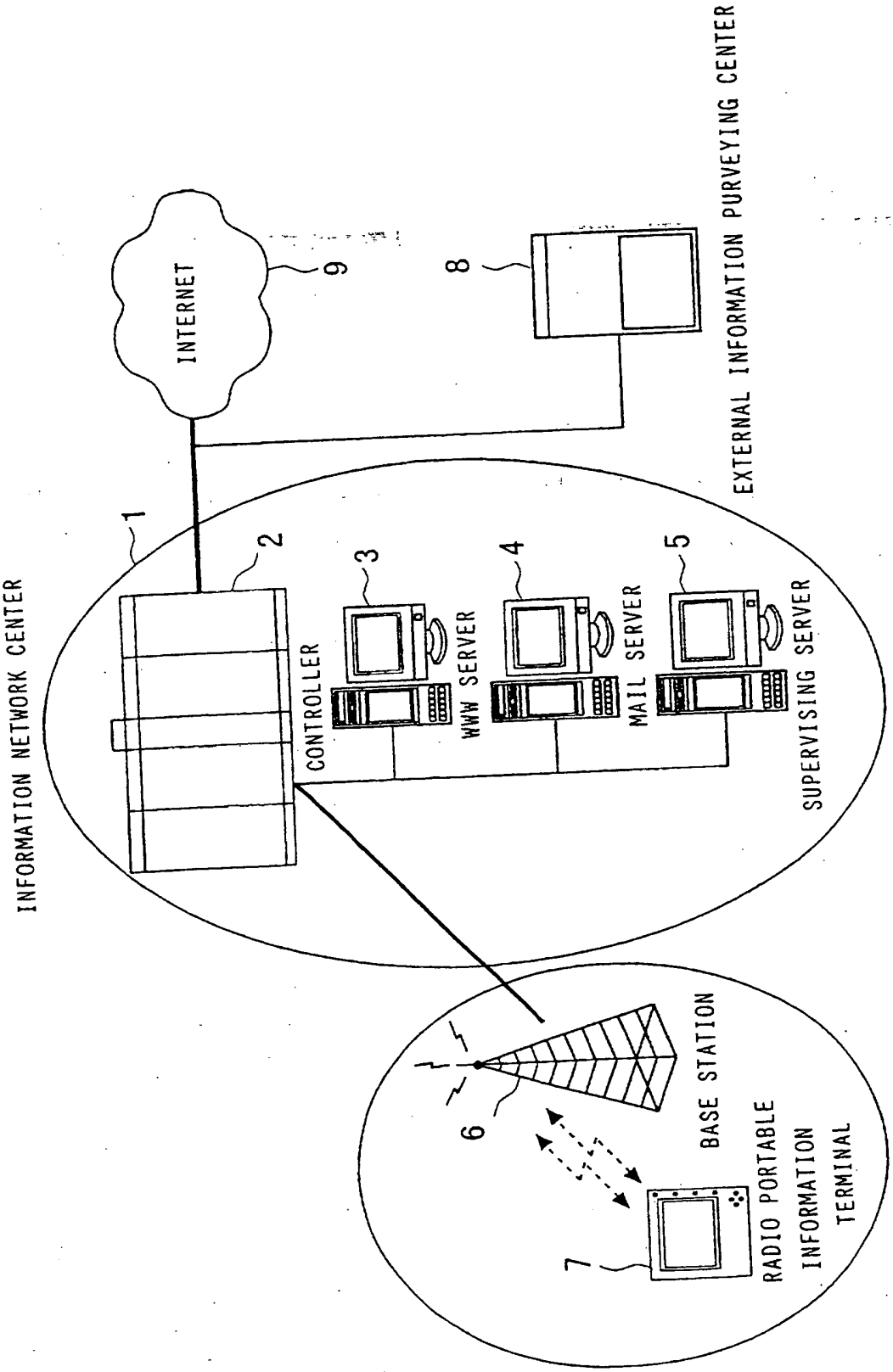

INFORMATION NETWORK CENTER
INTERNET
9
8
EXTERNAL INFORMATION PURVEYING CENTER
1
2
CONTROLLER
3
WWW SERVER
4
MAIL SERVER
5
SUPERVISING SERVER
6
BASE STATION
7
RADIO PORTABLE INFORMATION TERMINAL

FIG. 2

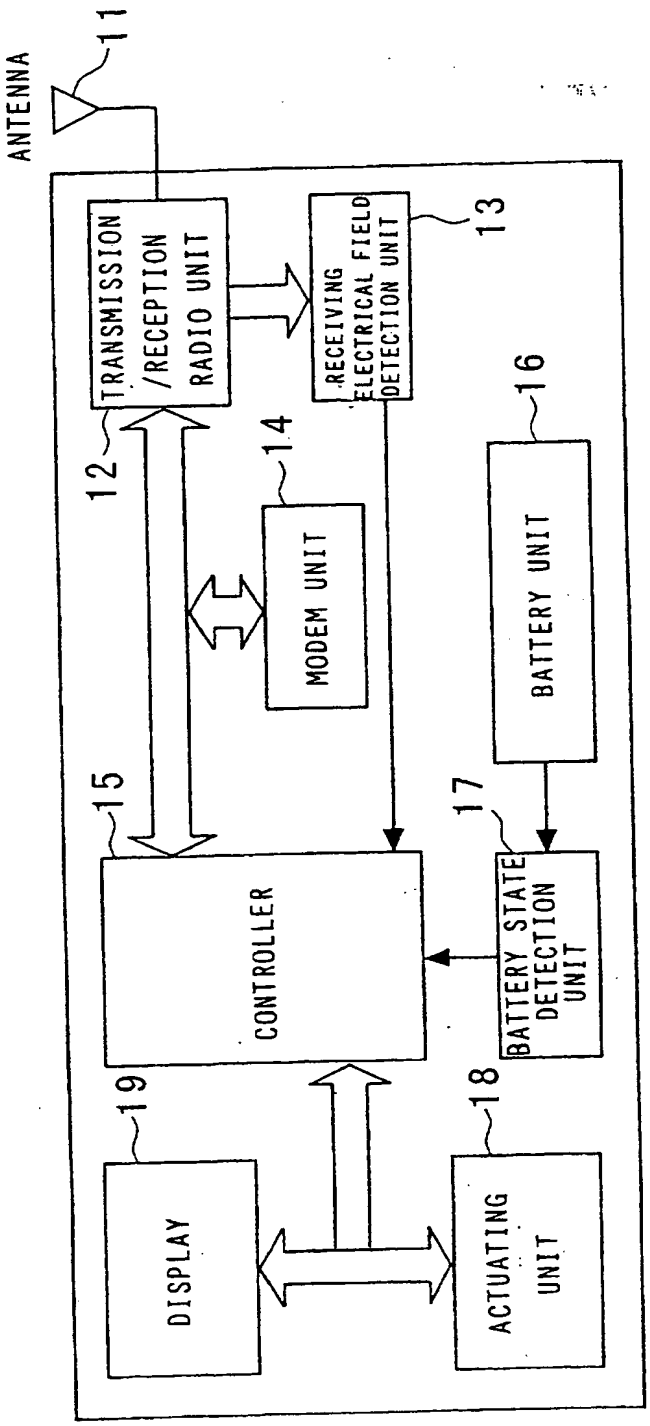

ANTENNA
11
TRANSMISSION /RECEPTION RADIO UNIT
12
RECEIVING ELECTRICAL FIELD DETECTION UNIT
13
MODEM UNIT
14
BATTERY UNIT
16
CONTROLLER
15
BATTERY STATE DETECTION UNIT
17
DISPLAY
19
ACTUATING UNIT
18

FIG. 3

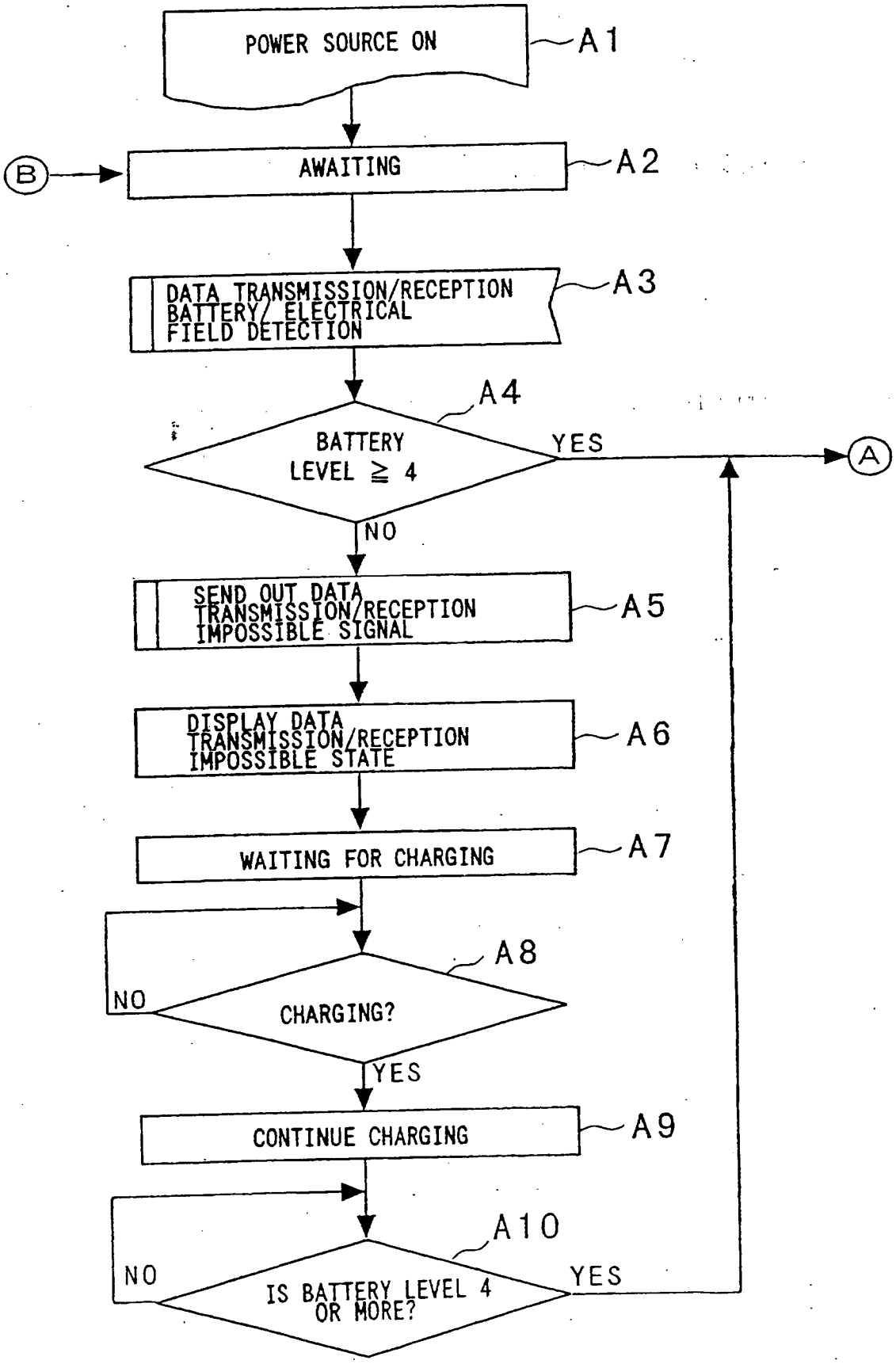

POWER SOURCE ON
A1
B
AWAITING
A2
DATA TRANSMISSION/RECEPTION
BATTERY/ ELECTRICAL
FIELD DETECTION
A3
A4
BATTERY
LEVEL ≧ 4
YES
A
NO
SEND OUT DATA
TRANSMISSION/RECEPTION
IMPOSSIBLE SIGNAL
A5
DISPLAY DATA
TRANSMISSION/RECEPTION
IMPOSSIBLE STATE
A6
WAITING FOR CHARGING
A7
A8
NO
CHARGING?
YES
CONTINUE CHARGING
A9
A10
NO
IS BATTERY LEVEL 4
OR MORE?
YES

FIG. 4

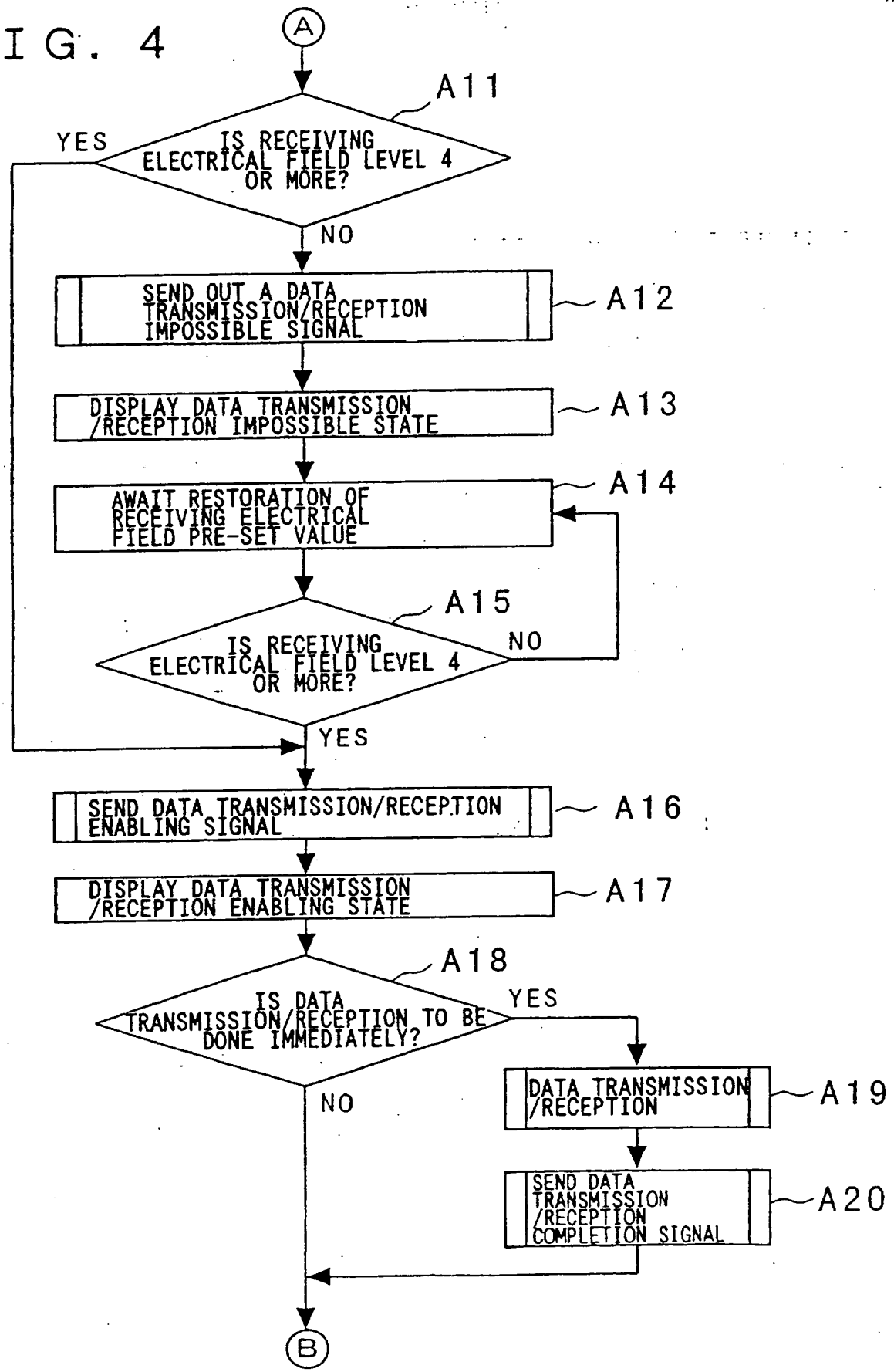

A
A11
IS RECEIVING ELECTRICAL FIELD LEVEL 4 OR MORE?
YES
NO
SEND OUT A DATA TRANSMISSION/RECEPTION IMPOSSIBLE SIGNAL
A12
DISPLAY DATA TRANSMISSION /RECEPTION IMPOSSIBLE STATE
A13
AWAIT RESTORATION OF RECEIVING ELECTRICAL FIELD PRE-SET VALUE
A14
A15
IS RECEIVING ELECTRICAL FIELD LEVEL 4 OR MORE?
NO
YES
SEND DATA TRANSMISSION/RECEPTION ENABLING SIGNAL
A16
DISPLAY DATA TRANSMISSION /RECEPTION ENABLING STATE
A17
A18
IS DATA TRANSMISSION/RECEPTION TO BE DONE IMMEDIATELY?
YES
NO
DATA TRANSMISSION /RECEPTION
A19
SEND DATA TRANSMISSION /RECEPTION COMPLETION SIGNAL
A20
B

FIG. 5

BATTERY LEVEL	ELECTRICAL FIELD LEVEL	SPEECH COMMUNICATION	RADIO PORTABLE INFORMATION TERMINAL	DATA TRANSMISSION/RECEPTION
5	5	POSSIBLE	POSSIBLE	POSSIBLE FOR PROLONGED TIME
4	4	POSSIBLE	POSSIBLE	POSSIBLE FOR SHORT TIME
3	3	POSSIBLE	POSSIBLE	IMPOSSIBLE
2	2	IMPOSSIBLE	POSSIBLE	IMPOSSIBLE
1	1	IMPOSSIBLE	IMPOSSIBLE	IMPOSSIBLE

FIG. 6

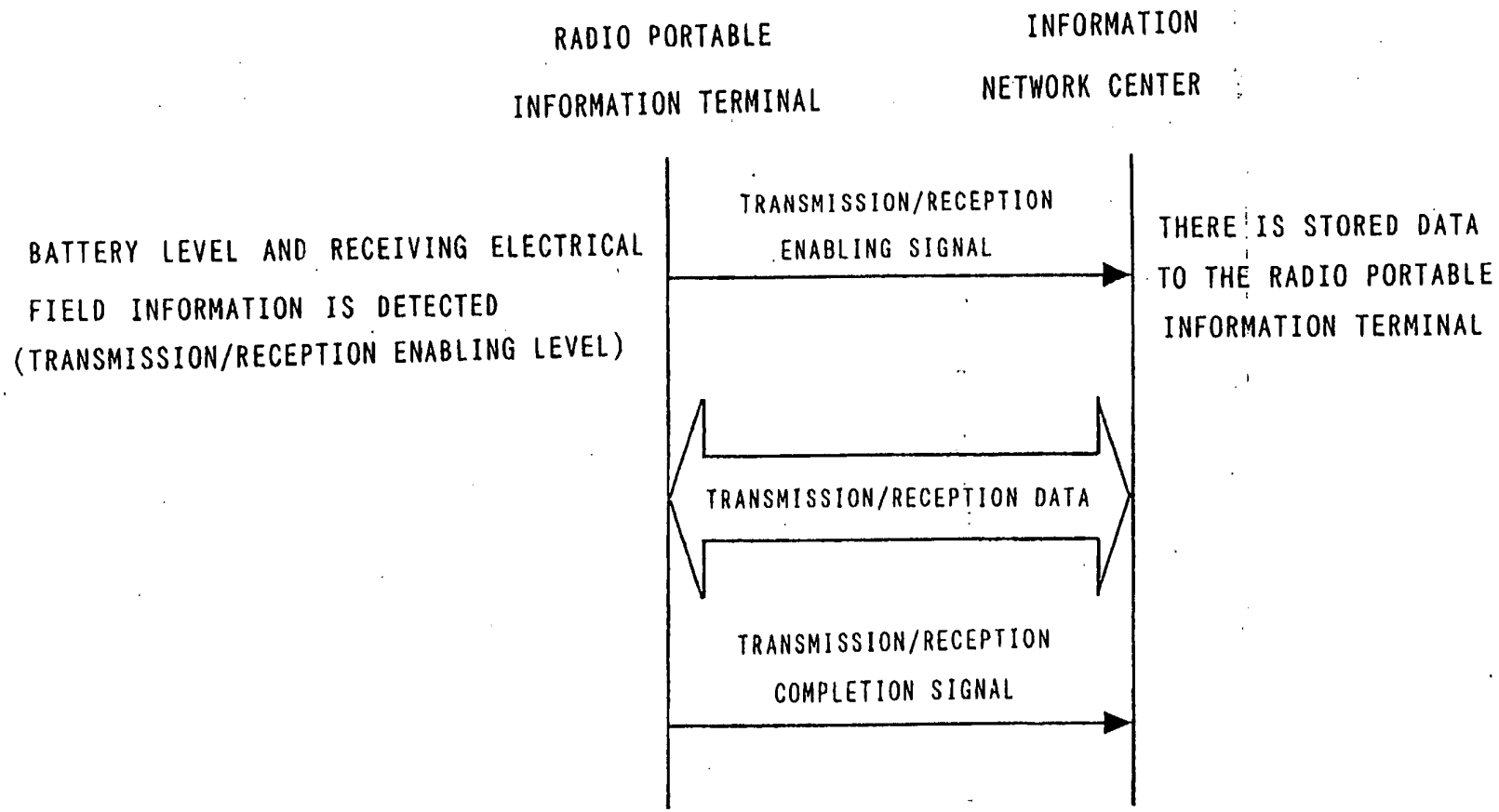

RADIO PORTABLE
INFORMATION TERMINAL
INFORMATION
NETWORK CENTER
BATTERY LEVEL AND RECEIVING ELECTRICAL
FIELD INFORMATION IS DETECTED
(TRANSMISSION/RECEPTION ENABLING LEVEL)
TRANSMISSION/RECEPTION
ENABLING SIGNAL
THERE IS STORED DATA
TO THE RADIO PORTABLE
INFORMATION TERMINAL
TRANSMISSION/RECEPTION DATA
TRANSMISSION/RECEPTION
COMPLETION SIGNAL

FIG. 7

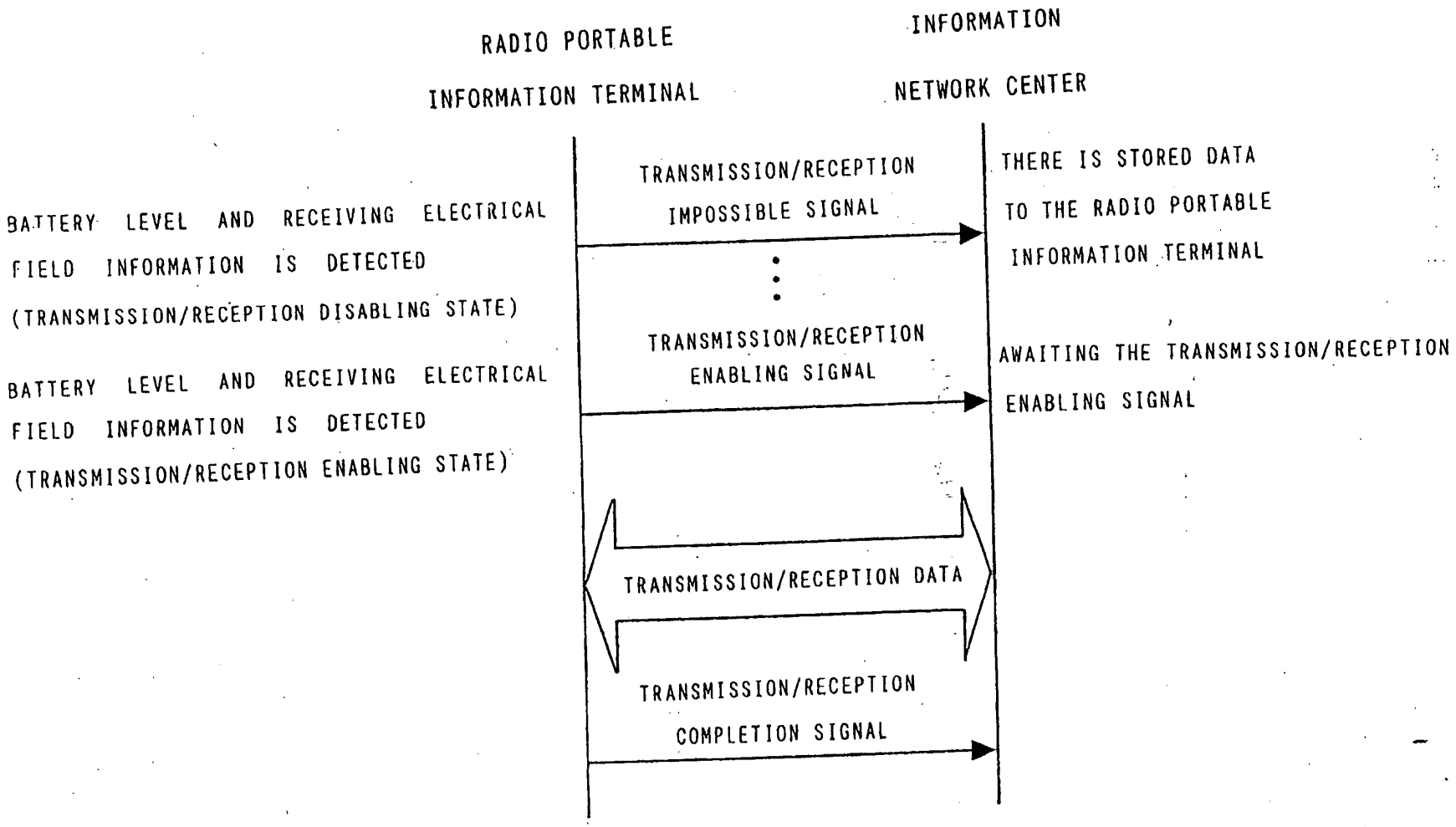

RADIO PORTABLE INFORMATION TERMINAL
INFORMATION NETWORK CENTER
BATTERY LEVEL AND RECEIVING ELECTRICAL FIELD INFORMATION IS DETECTED (TRANSMISSION/RECEPTION DISABLING STATE)
TRANSMISSION/RECEPTION IMPOSSIBLE SIGNAL
THERE IS STORED DATA TO THE RADIO PORTABLE INFORMATION TERMINAL
BATTERY LEVEL AND RECEIVING ELECTRICAL FIELD INFORMATION IS DETECTED (TRANSMISSION/RECEPTION ENABLING STATE)
TRANSMISSION/RECEPTION ENABLING SIGNAL
AWAITING THE TRANSMISSION/RECEPTION ENABLING SIGNAL
TRANSMISSION/RECEPTION DATA
TRANSMISSION/RECEPTION COMPLETION SIGNAL

FIG. 8

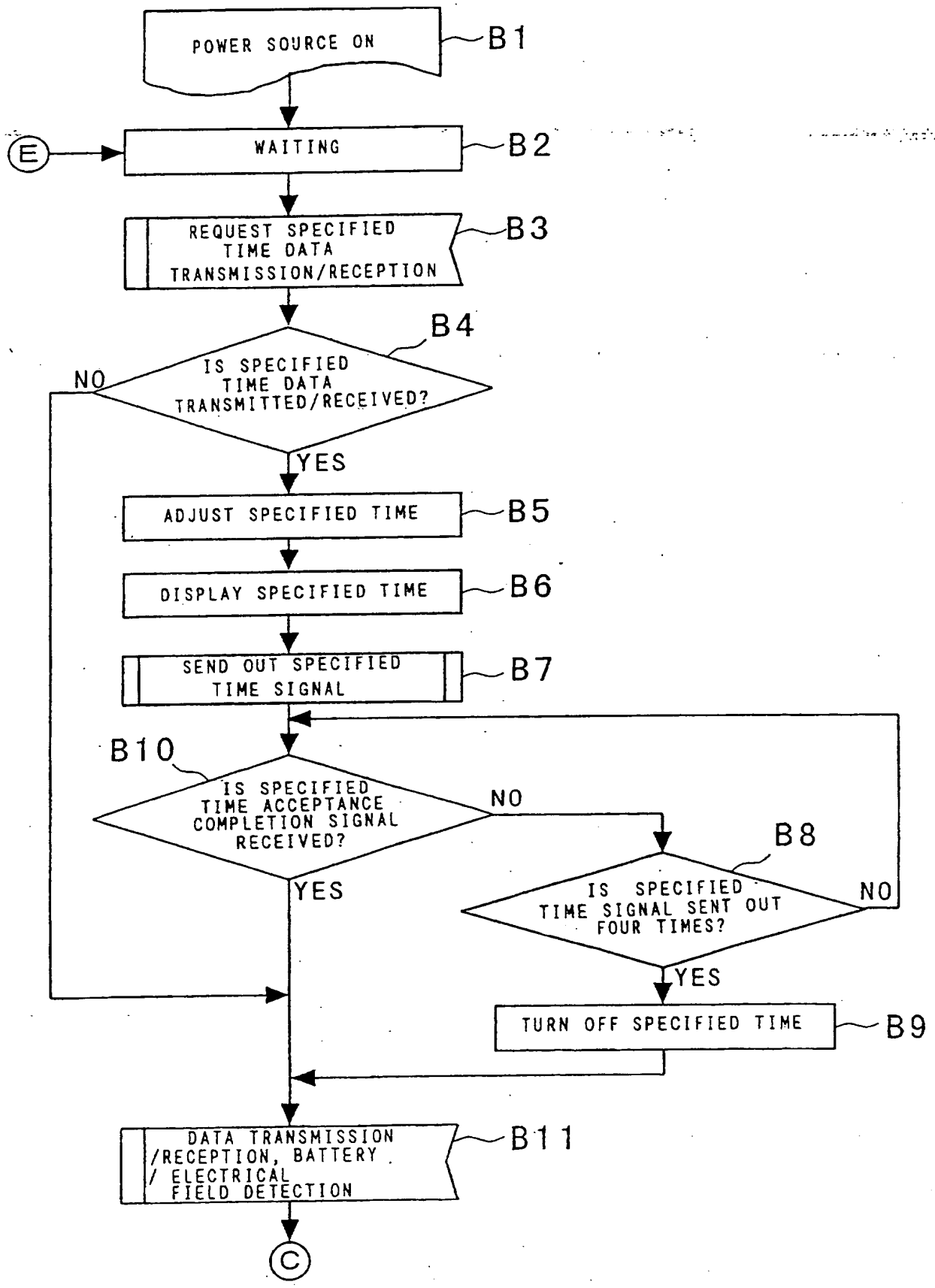

POWER SOURCE ON
B1
E
WAITING
B2
REQUEST SPECIFIED TIME DATA TRANSMISSION/RECEPTION
B3
B4
IS SPECIFIED TIME DATA TRANSMITTED/RECEIVED?
NO
YES
ADJUST SPECIFIED TIME
B5
DISPLAY SPECIFIED TIME
B6
SEND OUT SPECIFIED TIME SIGNAL
B7
B10
IS SPECIFIED TIME ACCEPTANCE COMPLETION SIGNAL RECEIVED?
NO
YES
B8
IS SPECIFIED TIME SIGNAL SENT OUT FOUR TIMES?
NO
YES
TURN OFF SPECIFIED TIME
B9
DATA TRANSMISSION /RECEPTION, BATTERY / ELECTRICAL FIELD DETECTION
B11
C

FIG. 9

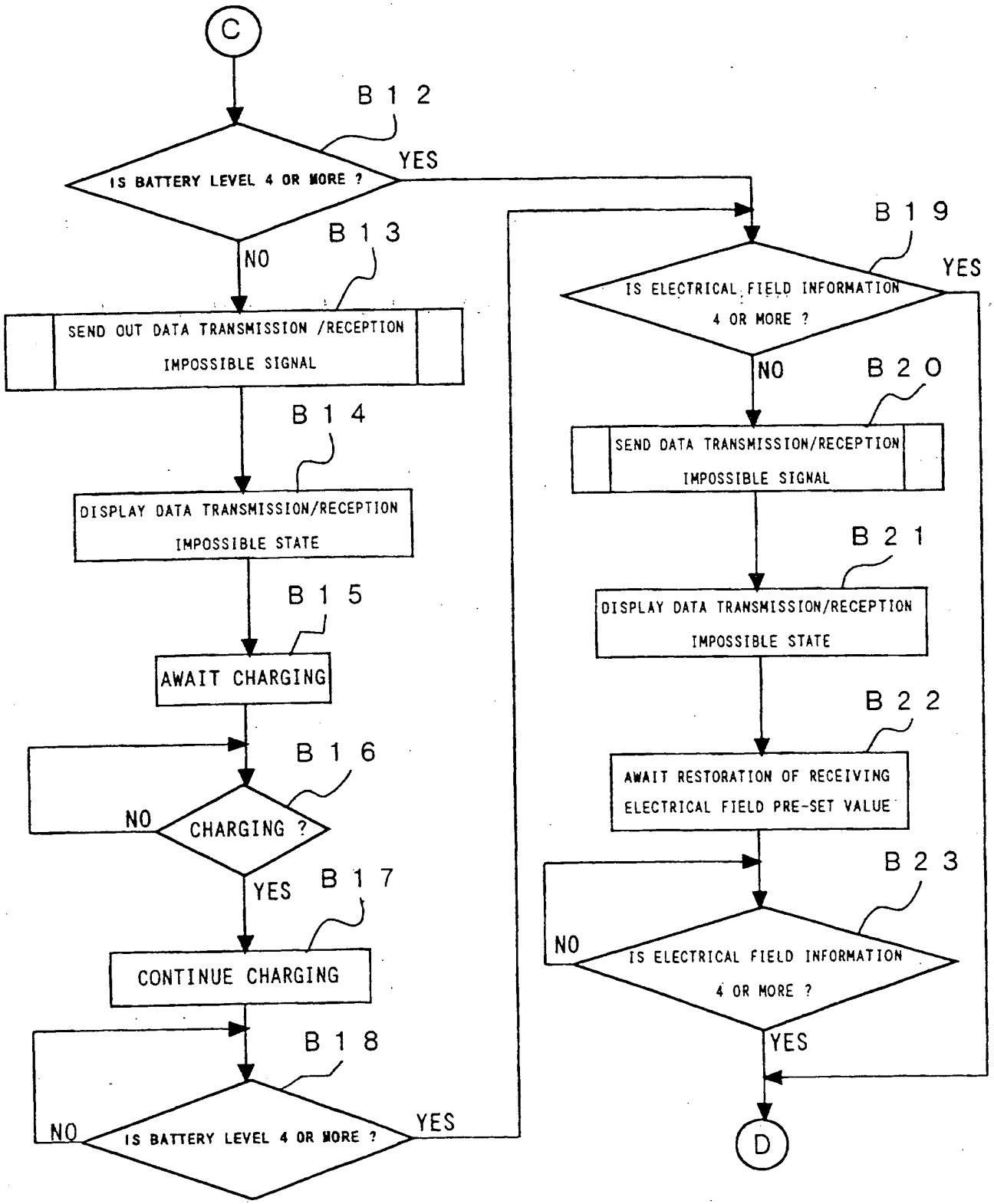

C
B12
IS BATTERY LEVEL 4 OR MORE ?
YES
NO
B13
SEND OUT DATA TRANSMISSION /RECEPTION IMPOSSIBLE SIGNAL
B14
DISPLAY DATA TRANSMISSION/RECEPTION IMPOSSIBLE STATE
B15
AWAIT CHARGING
B16
NO
CHARGING ?
YES
B17
CONTINUE CHARGING
B18
NO
IS BATTERY LEVEL 4 OR MORE ?
YES
B19
IS ELECTRICAL FIELD INFORMATION 4 OR MORE ?
YES
NO
B20
SEND DATA TRANSMISSION/RECEPTION IMPOSSIBLE SIGNAL
B21
DISPLAY DATA TRANSMISSION/RECEPTION IMPOSSIBLE STATE
B22
AWAIT RESTORATION OF RECEIVING ELECTRICAL FIELD PRE-SET VALUE
B23
NO
IS ELECTRICAL FIELD INFORMATION 4 OR MORE ?
YES
D

FIG. 10

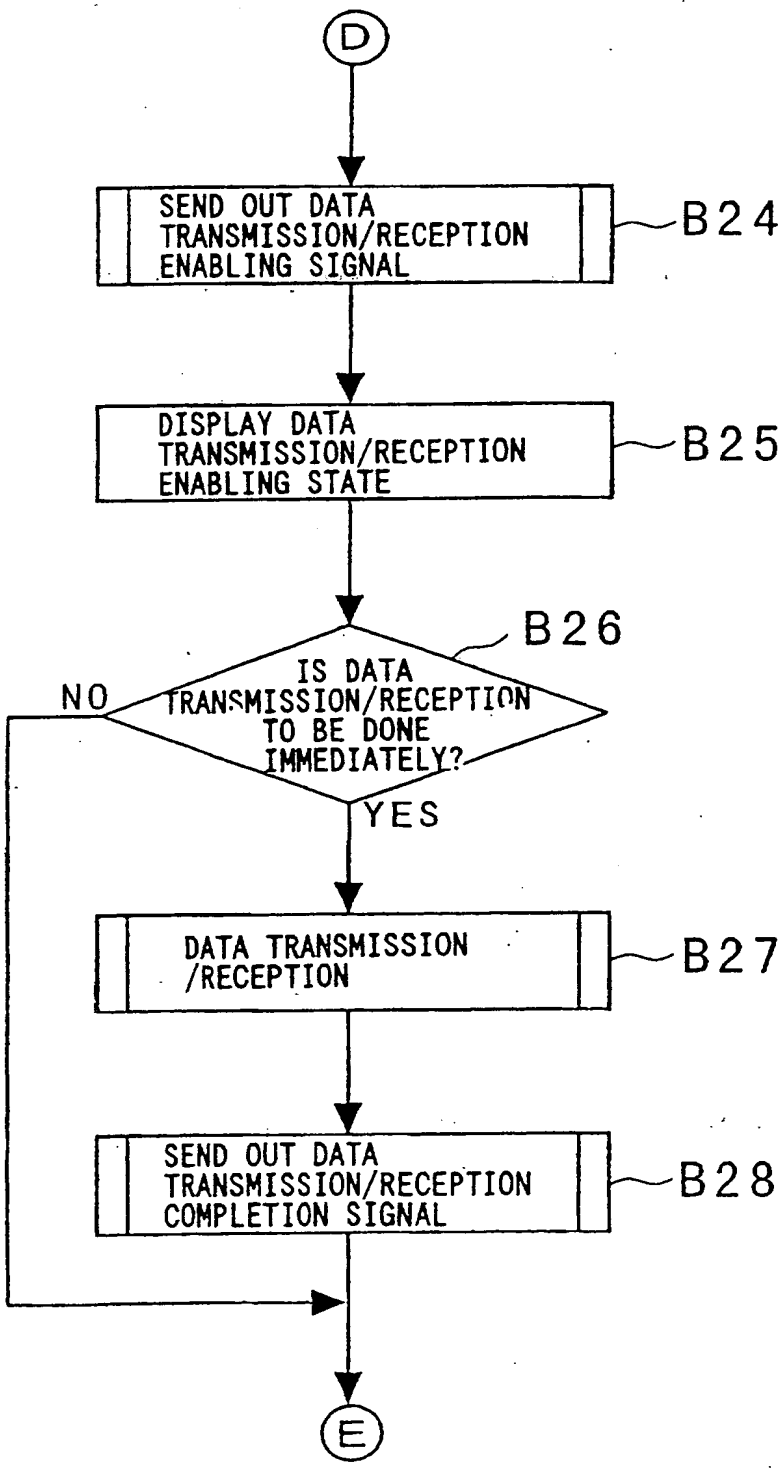

D
SEND OUT DATA TRANSMISSION/RECEPTION ENABLING SIGNAL
B24
DISPLAY DATA TRANSMISSION/RECEPTION ENABLING STATE
B25
B26
IS DATA TRANSMISSION/RECEPTION TO BE DONE IMMEDIATELY?
NO
YES
DATA TRANSMISSION /RECEPTION
B27
SEND OUT DATA TRANSMISSION/RECEPTION COMPLETION SIGNAL
B28
E

FIG. 11

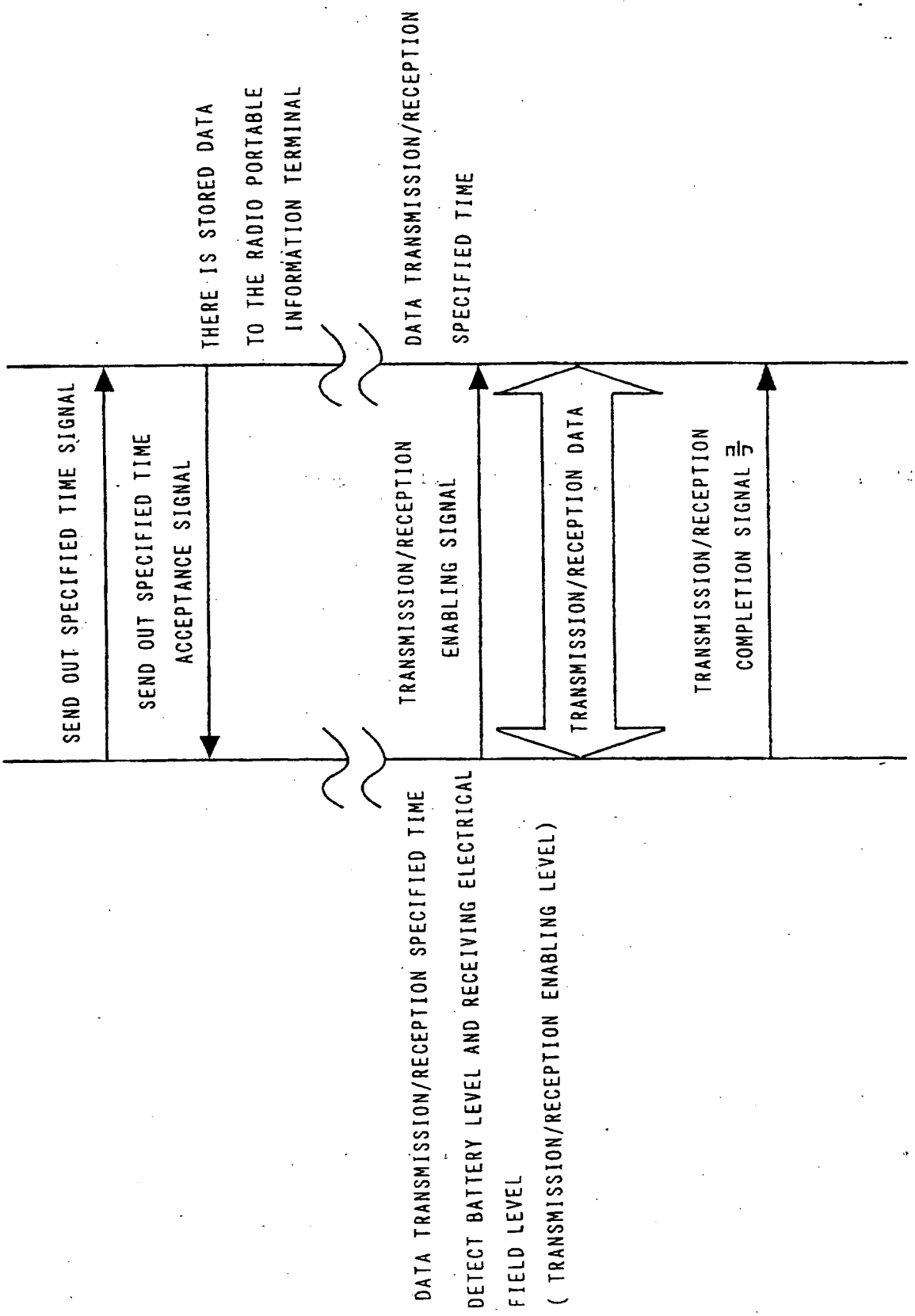
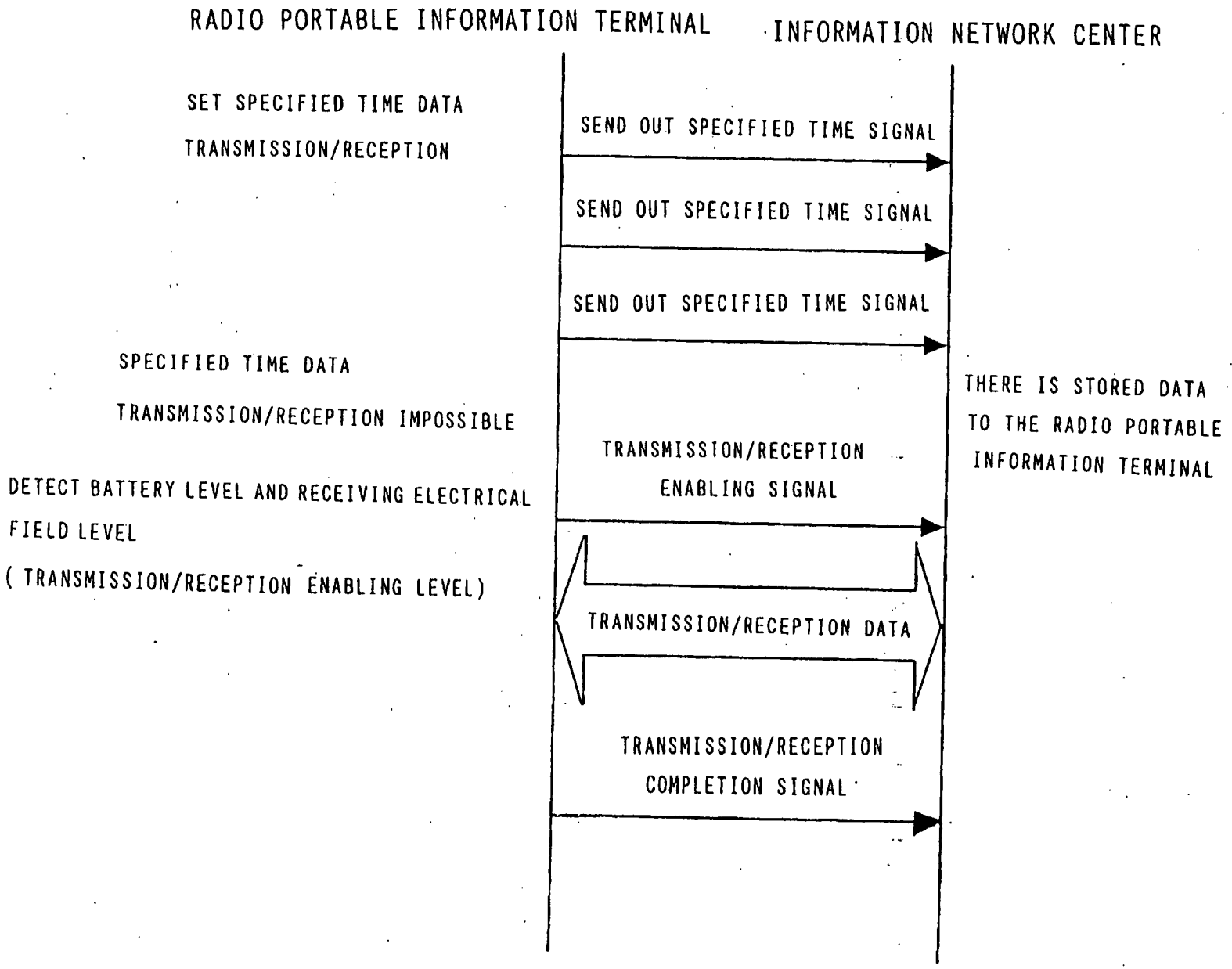

RADIO PORTABLE INFORMATION TERMINAL
INFORMATION NETWORK CENTER
SEND OUT SPECIFIED TIME SIGNAL
SEND OUT SPECIFIED TIME ACCEPTANCE SIGNAL
THERE IS STORED DATA TO THE RADIO PORTABLE INFORMATION TERMINAL
DATA TRANSMISSION/RECEPTION SPECIFIED TIME
TRANSMISSION/RECEPTION ENABLING SIGNAL
TRANSMISSION/RECEPTION DATA
TRANSMISSION/RECEPTION COMPLETION SIGNAL
DATA TRANSMISSION/RECEPTION SPECIFIED TIME
DETECT BATTERY LEVEL AND RECEIVING ELECTRICAL FIELD LEVEL
(TRANSMISSION/RECEPTION ENABLING LEVEL)

FIG. 12


RADIO PORTABLE INFORMATION TERMINAL
INFORMATION NETWORK CENTER
SET SPECIFIED TIME DATA
TRANSMISSION/RECEPTION
SEND OUT SPECIFIED TIME SIGNAL
SEND OUT SPECIFIED TIME SIGNAL
SEND OUT SPECIFIED TIME SIGNAL
SPECIFIED TIME DATA
TRANSMISSION/RECEPTION IMPOSSIBLE
THERE IS STORED DATA TO THE RADIO PORTABLE INFORMATION TERMINAL
TRANSMISSION/RECEPTION ENABLING SIGNAL
DETECT BATTERY LEVEL AND RECEIVING ELECTRICAL FIELD LEVEL
(TRANSMISSION/RECEPTION ENABLING LEVEL)
TRANSMISSION/RECEPTION DATA
TRANSMISSION/RECEPTION COMPLETION SIGNAL

PORTABLE RADIO INFORMATION TERMINAL AND DATA TRANSMITTING/RECEIVING SYSTEM THEREFOR

This invention relates to a portable radio (sometimes referred to as "wireless") information terminal and transmitting/receiving system. A radio data transmitting/receiving system may be used with advantage for data transmission/reception between a portable radio information terminal and an information network centre.

Portable information terminal devices for mobile computing have recently been proposed, and portable radio information terminals, which include portable information terminal devices having a wireless (radio) communication function attached to a portable information terminal device, have also been proposed. Such a portable radio information terminal may be connected for communication with an information network centre via a radio base station which is connected to a public network. The public network may include a WWW (world wide web) server supervising WWW information, or an E-mail server, in order to exchange the information with the information network centre connected to the internet, as will be described below.

In such an arrangement, a user of the portable radio information terminal may wish to check the residual capacity of a cell or battery by means of an indication on a display unit of the portable radio information terminal, or the intensity of the electrical field displayed, for example, by means of an antenna symbol, in order to indicate readiness for data reception.

If a PUSH type information distribution is to be made from an

information terminal network centre to a portable radio information terminal, data is distributed to the portable radio information terminal when it is not known whether or not the portable radio information terminal is ready for reception. If, in such a case, reception is not possible at the portable radio information terminal due, for example, to the fact that the battery power is off, the result is the need for a wasteful re-transmission of the data.

As discussed above, the previously proposed portable radio information terminal system has the following inconveniences.

Firstly, the user has to check the residual capacity of the battery, as displayed on a display unit of the portable radio information terminal, or the state of the intensity of the electrical field, displayed as an antenna symbol, and of the receipt of the data from the portable radio information terminal to the information network centre, each time that data is received, thus complicating the operation.

Secondly, when a PUSH type information distribution is to be made from the information network centre to the portable radio information terminal, data distribution is carried out even though it is not known whether or not the portable radio information terminal is ready for the receipt of the information, so that, if, for example, the battery capacity is low, the electrical field strength is weak, or the terminal is outside the service range, the portable radio information terminal cannot receive the information, and the result is a wasteful data transmission and the need for a retransmission.

The reason is that, when a PUSH type information distribution is to be made from an information network centre to a portable radio information terminal, the information network centre does not have the functional means for determining whether or not the portable radio information terminal is in a state in which it is ready for the reception of data.

In view of the above-mentioned problems of the previously proposed arrangements, features of a portable radio information terminal data transmitting system which is to be described below, by way of example in illustration of the present invention, are that there is no need to confirm the battery capacity or levels, or the intensity of the received electrical field, which has previously been considered to be necessary in data communication or reception in association with an information network centre, and that the state of the portable radio information terminal can be recognized at the information network centre, even when a PUSH type information distribution is to be made from the information network centre to the portable radio information terminal.

In a particular radio data transfer system using a portable radio information terminal to be described below, by way of example in illustration of the present invention, when the portable radio information terminal carries out data transmission or reception via a radio base station with an information network centre, the portable radio information terminal detects the current level of the battery capacity and the level of the received electrical field to

compare and verify whether or not the levels are sufficient to permit data transmission or reception to take place; if the current battery capacity level and the received electrical field level are at a level at which transmission or reception can be enabled, the portable radio information terminal formulates a data transmission or reception enabling signal and the formulated data transmission/reception enabling signal may be sent via the radio base station to the information network centre; whereby it is possible at the information network centre to check whether the portable radio information terminal is in the transmission/reception enabling state, so that it is possible to effect data transmission or reception with the portable radio information terminal.

The following description and drawings disclose, by means of examples, the invention.

In the drawings:-

Fig.1 shows diagrammatically an overall system configuration,

Fig.2 is a block schematic diagram of the structure of a portable radio information terminal, shown in Fig. 1,

Fig.3 is a flow diagram illustrating the processing steps in the portable radio information terminal shown in Fig. 1,

Fig.4, continues from Fig.3, and is a flow diagram illustrating further processing steps in the portable radio information terminal of Fig.1,

Fig.5 is a chart illustrating the contents of a data transmission/reception enabling detection table used in the arrangement of Fig. 1,

Fig.6 illustrates diagrammatically the transmission/reception sequence in the arrangement of Fig.1,

Fig. 7 illustrates diagrammatically impossible/possible sequences for transmission/reception in the arrangement of Fig. 1,

Fig.8 is a flow diagram illustrating the processing flow of a portable radio information terminal of a second arrangement,

Fig.9 continues from Fig.8, and is a flow diagram illustrating further processing steps in the portable radio information terminal of Fig.8.

Fig 10 continues from Fig.9, and is a flow diagram illustrating further processing steps in the portable radio information terminal of Fig.8.

Fig.11 illustrates diagrammatically a specified time data transmission/reception sequence in the arrangement of Fig. 8, and

Fig.12 illustrates diagrammatically an impossible specified time data transmission/reception sequence in the arrangement of Fig. 8.

A particular arrangement illustrative of the present invention, will now be described. When transmitting or receiving radio exchange data to or from a portable radio information terminal or an information network centre, a portable information terminal having a wireless communication function (referred to as 'portable radio information terminal'), or the radio data transmitting/reception system of an arrangement to be described by way of example in illustration of the present invention detects the battery capacity level required by the portable radio information terminal and the electrical field

level which permits reception to take place and advises the information network centre of the possible state of the portable radio information terminal regarding its ability to receive data.

This makes it possible to avoid data re-transmission of PUSH type data from the information network centre, or of mail data, or of information data from the world-wide web (WWW) having a large data volume, as a result of a low battery capacity or a worsened state of a received electrical field at the portable radio information terminal, during transmission or reception, in order to enable efficient data transmission or reception to take place.

Referring to Fig.1 there is shown an information network centre 1 which is made up of a WWW server 3 supervising WWW information, an E-mail server 4 supervising E-mail data, a supervising server 5 for supervising the state of the portable radio information terminal and a controller 2 for controlling the information network centre 1.

The information network centre 1 is connected to an external information supply centre 8 and to the internet 9.

If, in exchanging data with the information network centre 1, when a portable radio information terminal 7 detects the current level of the battery capacity, and the level of the received electrical field, and verifies that the current battery capacity level and the level of the received electrical field at the portable radio information terminal 7 are at a transmission/reception enabling level, the portable radio information terminal 7 formulates a data

transmission/reception possible signal and sends this transmission/reception possible signal to a base station 6. The data transmission/reception signal is transmitted via the base station 6 to the information network centre 1, while being transmitted via the controller 6 to the supervising server 5.

The WWW server 3 and the mail server 4 verify that the portable radio information terminal 7 which has transmitted the transmission/reception possible signal to the supervising server 5 is in the transmission/reception possible signal state, after which the WWW server 3 transmits the relevant WWW data and the mail data to the portable radio information terminal 7.

Referring again to Fig. 1, which shows the entire system configuration of a radio data transmission/reception system, it will be understood that there is a portable radio information terminal 7, which is a portable information terminal having an attached radio function, and a base station 6 for relaying radio data from the portable radio information terminal 7. The information network centre 1 includes, as mentioned above, the WWW server 3 for data transmission/reception with the portable radio information terminal 7, a mail server 4, a supervising server 5 and a controller 2 for supervising the information network centre 1. The information network centre 1 is connected to an external information supplying centre 8 for supplying the information etc. to the portable radio information terminal 7 and to the internet 9.

If the portable radio information terminal 7 transmits/sends data to or

from the information network centre 1, the portable radio information terminal 7 detects the battery capacity level and the received electrical field level required for data transmission/reception. If the detected battery capacity level and the received electrical field level are at a transmission/reception enabling level, the portable radio information terminal 7 formulates a data transmission/reception possible signal and transmits the data transmission/reception possible signal via the base station 6 to the information network centre 1, whereby the data transmission/reception possible signal is transmitted via the controller 2 to the supervising server 5. The portable radio information terminal 7 also displays the data transmission/reception enabling signal on the display unit.

The WWW server 3 and the mail server 4 of the information network centre 1 check the state of the transmission/reception possible signal from the portable radio information terminal stored in the supervising server 5. After verifying that the portable radio information terminal is in the transmission/reception enabling state, the WWW server 3 and the mail server 4 transmit the relevant WWW data and the mail data to the portable radio information terminal 7.

On the other hand, if the portable radio information terminal 7 verifies, from the level of the detected battery capacity, and the level of the electrical field intensity, that data transmission/reception is impossible, the portable radio information terminal 7 formulates a data transmission/reception

disabling signal and routes a data transmission/reception impossible signal via the base station 6 to the information network centre 1. If the battery capacity level is insufficient for data transmission/reception, it is arranged that the battery is electrically charged. If the received electrical field intensity level is not suitable for data transmission/reception, the portable radio information terminal 7 sends a data transmission/reception impossible signal to the information network centre 1 to wait for the restoration of the level of the received electrical field intensity. On the other hand, if the level of the received electrical field intensity is in the data transmission/reception enabling state, the portable radio information terminal 7 sends a data transmission/reception possible signal to the information network centre 1 to effectuate data transmission/reception between it and the information network centre 1.

Referring now to Fig. 2, the portable radio information terminal 7 includes a transmission/reception radio unit 12, a detection unit 13, for detecting the intensity of the received electrical field from the transmission/reception radio unit 12, a controller 15 for controlling the portable radio information terminal 7 in its entirety, a modem 14 for processing the data formulated by the controller 15 as transmission/reception data, a battery unit 16 for providing the source of power to the portable radio information terminal 7, and a battery state detection unit 17 for detecting the state of the battery. The portable radio information terminal 7 also includes an

actuating (input) unit 18 and a display unit 19 for displaying the information obtained on the state of the portable radio information terminal 7 and the strength of the transmission/reception data.

Referring to Figs.1 to 4, the operation of the above-described example will now be explained.

The source of the power of the portable radio information terminal 7 is turned on by the actuating unit 18 (step Al of Fig. 3 for measuring the characteristics of an optical pickup).

The portable radio information terminal 7 then enters a waiting state (step A2 of Fig.3). The portable radio information terminal 7 then detects whether or not data transmission/reception is possible (step A3 of Fig.3).

First, the controller 15 captures the current battery capacity level from the battery state detection unit 17 and compares the captured battery capacity level to a data transmission/reception enabling detection table (see Fig.5) to verify whether or not the battery level is less than 4 (step A4 in Fig. 3).

Referring now to Fig. 5, the data transmission/reception enabling detection table shown is a table in which there are tabulated the battery level values, the electrical field level values, the possibility of voice communication, the usable state of the portable information terminal and the possibility of data transmission/reception, which is stored in a memory portion, not shown, of the controller 15 of the portable radio information terminal 7. The level of the battery of the battery unit 16 and the electrical field level are detected by the

battery state detection unit 17 and by a received electrical field detection unit 13, respectively, and the information is routed to the controller 15.

In the example of the data transmission/reception enabling detection table, data transmission/reception is 'impossible' with a battery level of '3' or less, while a judgement of 'possible if for shorter time' and 'possible for prolonged time' with battery levels of '4' and '5', respectively. If the electrical field level is '4', data transmission/reception is 'possible for a short time', whereas, if the electrical field level is '5', data transmission/reception is 'possible for a prolonged time'.

Referring again to Fig. 3, if the battery level, is found at step A4, to be '4' or above, processing transfers to the received electrical field detection processing at step A11 of Fig. 4.

If the battery level is found at step A4 to be '3' or less, the controller 15 formulates a data transmission/reception impossible signal data and the data transmission/reception impossible signal data is routed via modem unit 14, transmission/reception radio unit 12 and antenna 11 from where a data transmission/reception impossible signal is routed via base station 6 to the supervising server 5 of the information network centre 1.

A data transmission/reception impossible state is then displayed on the display unit 19 (step A6 of Fig. 3).

The state is now that of waiting for the battery charging to take place (step A7 of Fig. 3). Charging of the battery then beings and the charging is

continued (step A8 and step A9 of Fig. 3). If the battery level is '4' or more (YES branch to step A9 of Fig. 3), processing transfers to the processing of the detection of the received electrical field level at step A11.

The controller 15 then detects the current received electrical field level, which has been captured from the received electrical field detection unit 13, and compares the field level to the data transmission/reception enabling the detection table for collation, in order to verify whether or not the received electrical field level is less that '4' (step A11 of Fig. 4).

If, upon the decision taken at step A11, the received electrical field level is found to be '3' or less, the controller 15 formulates the data transmission/reception impossible signal data in the controller 15. The data transmission/reception impossible signal data, thus formulated, is sent via the base station 6 to the supervising server 5 of the information network centre 1 (step A12 of Fig. 4).

The data transmission impossible state is then displayed on the display unit 19 (step A13 of Fig. 4), and the restoration of the received electrical field level to '4' or more (steps 14, 15 of Fig. 4) is awaited.

When the battery level is '4' or more, and the received electrical field level is '4' or more, the controller 15 causes a data transmission/reception possible signal data to be formulated and transmitted via modem unit 14, transmission/reception radio unit 12 and the antenna 11. The transmitted data transmission/reception possible signal is sent via the base station 6 to

the supervising server 5 of the information network centre 1 (step A16 of Fig. 4).

The data transmission possible state is then displayed on the display unit 19 (step A17 of Fig. 4).

The controller 15 then verifies whether or not data transmission/reception is to be carried out immediately (step A18 of Fig.4).

If it is decided at step A18 of Fig.4 that data transmission/reception is not to be carried out immediately, the controller reverts to the awaiting state of step A2. If data transmission/reception is to be carried out immediately, data transmission/reception is carried out between the portable radio information terminal 7 and the information network centre 1 (step A19 of Fig. 4).

When the data transmission/reception data transmission/reception ends, a data transmission/reception complete signal is routed from the portable radio information terminal 7 to the supervising server 5 of the information network centre 1 (step A20 of Fig. 4) in order to revert to the awaiting state of step A2 in Fig. 3.

Fig. 6 shows the operating sequence of the example and specifically the transmission/reception possible sequence in a data transmission/reception possible sequence in a data transmission/reception system in which the data transmission/reception possible signal is transmitted between the portable radio information terminal 7 and the information network centre 1.

Referring to Fig. 6, if the battery level and the received electrical field level are detected and are found to be at the transmission/reception enabling level, the transmission/reception enabling signal is transmitted via the base station to the information network centre 1 to transfer the transmission/reception data between the information network centre 1 and the portable radio information terminal 7. After the end of the transmission/reception, the transmission/reception completion signal is sent from the portable radio information terminal 7 to the information network centre 1.

Fig. 7 shows the operating sequence of the example, and more specifically, the transmission/reception impossible/possible sequence of the data transmission/reception system after a data transmission/reception possible signal has been transmitted and after a data transmission/reception impossible signal has been sent between the portable radio information terminal 7 and the information network centre 1.

Referring to Fig. 7, if the portable radio information terminal 7 detects the battery level and the received electrical field level, and finds that transmission/reception is not possible, the transmission/reception impossible signal is transmitted via the base station 6 to the information network centre 1 and, if data is accumulated in the information network centre 1 which is to be transmitted to the portable radio information terminal 7, the receipt is awaited from the portable radio information terminal 7 of the transmission/reception

enabling signal. If the portable radio information terminal 7 detects the battery level and the received electrical field level, and finds that transmission/reception is possible, the transmission/reception possible signal is transmitted via the base station 6 to the information network centre 1 in order to transfer the transmission/reception data between the information network centre 1 and the portable radio information terminal 7. After the end of transmission/reception, the transmission/reception completion signal is routed from the portable radio information terminal 7 to the information network centre 1.

Another example illustrative of the present invention will now be described, by way of example. This example is similar in structure to the portable radio information terminal shown in Fig. 2. The data transmission/reception enabling detection table also is similar in structure to the data transmission/reception enabling detection table shown in Fig. 4. Figs. 8 to 10 are flowcharts showing the processing flow in this example. Referring to Figs. 2, 5 and 8 to 10, the operation of this example will now be explained.

Referring to Figs. 2, 4 and 7, the power source of the portable radio information terminal 7 is turned on by the actuating unit 18 (step B1 of Fig. 8).

The portable radio information terminal 7 enters an awaiting state (step B2 in Fig. 8) and subsequently verifies whether or not data transmission/reception is to be made within a specified time (steps B3, B4 of Fig.8). If data transmission/reception is not made within the specified time,

processing transfers to the data transmission/reception battery/electrical field detection by the operation of step B11 of Fig. 8.

If, as a result of the decision of step B4 of Fig. 8, data transmission/reception within the specified time is to be made, the designated time is entered from the actuating unit 18 (step B5 of Fig. 8) in order to display the designated time on the display unit 19 (step B6 of Fig. 8).

The controller 15 formulates the designated time signal and transmits the specified time signal via the modem unit 14, the transmission/reception radio unit 12 and the antenna 11 so that the specified time signal is sent out via the base station 6 to the supervising server 5 of the information network centre 1.

The controller 15 checks to see whether or not the specified time acceptance completion signal has been received from the modem 14 (step B10 of Fig. 8). If the specified time acceptance completion signal has not been received, the specified time signal is sent, for example, up to three times to the supervising server 5 of the information network centre 1 (steps B7 and B8 of Fig. 8). When the specified time signal has been sent out four or more times (YES branch at step B8), the specified time data transmission/reception is disabled and the specified time display on the display unit 19 is extinguished (step B9 in Fig. 8). The controller 15 then transfers to the data transmission/reception battery/electrical field detection processing of step B11.

On the other hand, if the specified time acceptance completion signal is received via the base station 6 from the supervising server 5 of the information network centre 1 (YES branch at B10 of Fig. 8), the controller 15 proceeds to the data transmission/reception battery/electrical field detection processing of step B11.

Then, in the data transmission/reception battery/electrical field detection processing of step B11, the controller 15 captures the state of the battery unit 16 detected in the battery state detection unit 17, and compares the current battery capacity level to the data transmission/reception enabling detection table (see Fig. 5) to verify whether or not the battery level is '4' or more (step B12 of Fig. 9). If the battery level is '4' or more, the controller 15 proceeds to the received electrical field detection processing of step B19 of Fig. 9.

If the battery level is less than '4' at step B12 of Fig. 9, the controller 15 formulates the data transmission/reception impossible signal data for transmission of the data transmission/reception impossible signal from the modem unit 14 via the transmission/reception radio unit 12, and the antenna 11 so that the transmission/reception impossible signal is sent out via the base station 6 to the supervising server 5 of the information network centre 1 (step B13 of Fig. 9) in order to display the data transmission/reception impossible state on the display unit 19 (step B14).

The controller 15 then proceeds to await the charging state (step B15

of Fig. 9). Charging of the battery continues following its commencement (steps B16 and B17 of Fig. 9). If the battery has been charged such that the battery level is '4' or more (step B18), the controller 15 proceeds to the processing of the received electrical field detection, step B19 of Fig. 9.

The controller 15 collates and compares the current received electrical field level, as detected by the received electrical field detection unit 13, to the data in the transmission/reception enabling detection table (see Fig. 5), in order to verify whether or not the received electrical field level is '4' or more (step B19 of Fig. 9).

If the current received electrical field level is at the transmission/reception impossible level, the controller 15 formulates transmission/reception impossible signal data whereupon a data transmission/reception impossible signal is transmitted from the modem unit 14, via the transmission/reception radio unit 12 and the antenna 11 in order to send out a data transmission/reception impossible signal via the base station 6 to the supervising server 5 of the information network centre 1 (step B20 of Fig. 9) and to display the transmission/reception impossible state on the display unit 19.

If the battery level is '4' or more and the received electrical field level is '4' or more, the controller 15 formulates a data transmission/reception possible signal in order to send out a data transmission possible state signal from the modem unit 14, via the transmission/reception radio unit 12 and the antenna

11 to send out the data transmission possible state signal via the base station 6 to the supervising server 5 of the information network centre 1 (step B24 of Fig. 10) and to display the data transmission possible state on the display unit 19 (step B25 of Fig. 10).

It is further verified whether or not data transmission/reception is to be made immediately (step B26 of Fig. 10). If data transmission/reception is not to be made immediately; the controller 15 reverts to the awaiting operation of step B2 and, if data transmission/reception is to be made immediately, data transmission/reception is carried out between the portable radio information terminal 7 and the information network centre 1 (step B27 of Fig. 10).

When the data transmission/reception ends, a data transmission/reception completion signal is sent from the portable radio information terminal 7 to the information network centre 1 (step B28 of Fig. 10) to revert to the awaiting operation of B2 of Fig. 8.

Fig.10 shows the operating sequence of an example, and specifically the specified time data transmission/reception sequence in the case in which a specified time data transmission/reception setting is made between the portable radio information terminal 7 and the information network centre 1 and the data transmission/reception is made within a specified time.

Referring to Fig. 10, if specified data transmission/reception is to be carried out in the portable radio information terminal 7, a specified time signal is formulated from the input specified time and sent out via the base station to

the information network centre 1. If a specified time acceptance completion signal is sent out via the base station to the information network centre 1 and the time is the data transmission/reception specified time, the portable radio information terminal 7 detects the battery level and the received electrical field level. If these levels are at the transmission/reception enabling level, a transmission/reception possible signal is transmitted via the base station to the information network centre 1 and the transmission/reception data is transferred between the information network centre 1 and the portable radio information terminal 7. After completion of the transmission/reception, a transmission/reception completion signal is sent from the portable radio information terminal 7 to the information network centre 1.

Fig.11 shows the operating sequence of a preferred example and specifically shows the specified time data transmission/reception impossible sequence in the case in which the data is transmitted/received in the specified time between the portable radio information terminal 7 and the information network centre 1 and transmission/reception is not possible.

Referring to Fig.11, if the specified time data transmission/reception is to be made at the portable radio information terminal 7, a specified time signal is formulated from the input specified time and a specified time signal is sent out via the base station to the information network centre 1. If a specified time acceptance completion signal is not received from the information network centre 1, the specified time signal is re-transmitted up to three times to the

information network centre 1. If nevertheless the specified time acceptance completion signal is not received from the information network centre 1, the specified time data transmission/reception is judged to be impossible and the battery level/electrical field level is detected for the data transmission/reception. If the level is at the transmission/reception enabling level, data transmission/reception is carried out and subsequently a transmission completion signal is transmitted,

The benefits of the arrangements described above will now be described.

In the arrangements that have been described by way of example in illustration of the present invention, if data is to be transmitted or received between the portable radio information terminal and the information network centre, it is possible for a user to send or receive the information between the portable radio information terminal and the information network centre without the need to confirm the residual battery capacity or the state of intensity of the electrical field, such as that given by the display of an antenna symbol, on the display unit of the portable radio information terminal, thus significantly improving operability and convenience.

Also, in those cases where automatic incoming or PUSH type information distribution of WWW data or E-mail data from the information network centre to the portable radio information terminal is to be carried out, where the power source of the portable radio information terminal is not

turned on, where the battery capacity is low, where the level of the electrical field is low, or where the terminal is out of the service area, there is little risk of distributing data without the operator comprehending the state of the terminal. The wasteful distribution of data from the information network centre, such as re-transmission, can be minimized in order to avoid failure of the data reception and to improve the data transmission/reception.

It will be understood that, although particular arrangements illustrative of the invention have been described, by way of example, variations and modifications thereof, as well as other arrangements may be made within the scope of the appended claims.

CLAIMS

1. A radio data transfer system for a portable radio information terminal wherein, when the portable radio information terminal effects data transmission/reception via a radio base station and an information network centre, the portable radio information terminal detects the current capacity level of a battery and the level of a received electrical field in order to compare and verify whether or not the levels are sufficient to permit the data transmission/reception to take place, and upon the current capacity level of the battery and the level of the received electrical field being judged to be at the transmission/reception enabling level, the portable radio information terminal formulates a data transmission/reception enabling signal and the data transmission/reception enabling signal is sent via the radio base station to the information network centre, and the information network centre checks that the portable radio information terminal is in the transmission/reception enabling state in order to effect data transmission/reception with the portable radio information terminal.

2. A radio data transfer system for a portable radio information terminal as claimed in claim 1 wherein, if the current level of the battery capacity, or the level of the received electrical field are not up to the transmission/reception enabling level, the portable radio information terminal formulates a data transmission/reception impossible signal and the data transmission/reception impossible signal is sent via the radio base station to the information network

centre, and wherein upon the receipt of the data transmission/reception impossible signal, the information network centre operates a control such that data transmission/reception with the portable radio information terminal is not effected until the portable radio information terminal transmits the data transmission/reception possible signal to establish the data transmission/reception enabling state.

3. A portable radio information terminal for effecting data transmission/reception via a radio base station with an information network centre, including first detection means for detecting the residual capacity of a battery driving the information terminal, second detection means for detecting a received electrical field level, means for verifying, at the time of the data transmission/reception, whether or not the current residual capacity of the battery and the received level of the electrical field of the terminal, as detected by the first and second detection means, respectively, are at levels which are sufficient to permit data transmission/reception with the information network centre, and means for formulating a data transmission/reception enabling signal if the data transmission/reception is verified as possible and for transmitting the data transmission/reception possible signal via the radio base station to the information network centre.

4. A portable radio information terminal as claimed in claim 3 further including means for performing a control for formulating a data transmission/reception impossible signal for transmitting the data transmission/reception impossible

signal via the radio base station to the information network centre if the residual capacity of the battery is less than a pre-set value, the control means providing a control for displaying the data transmission/reception impossible state on a display unit of the terminal, and means for effecting a control for detecting the level of the received electrical field by the second detection means if, after charging the battery, in the case in which the residual battery capacity is less than a pre-set value the level of the battery capacity is sufficient to attain the pre-set value, formulating a data transmission/reception possible signal, or a data transmission/reception impossible signal, depending on whether the current received level of the electrical field level is sufficient to, or below, a pre-set value, and for sending out the data transmission/reception possible signal, or a data transmission/reception impossible signal, via the radio base station to the information network centre.

5. A portable radio information terminal as claimed in claim 3 further including means for formulating a specified time signal from the specified time entered from an actuating unit of the portable radio information terminal in the case in which a specified time data transmission/reception is to be made in the portable radio information terminal, the formulating means transmitting the specified time signal via the radio base station to the information network centre, wherein a specified time acceptance completion signal is received from the information network centre via the radio base station, and when it is at the data transmission/reception specified time, the residual level of the

battery capacity and the level of the received electrical field of the portable radio information terminal are detected, whereupon if the detected levels is on, or above, the data transmission/reception enabling level, a data transmission/reception enabling signal is transmitted via the radio base station to the information network centre, and wherein transmission/reception data is transferred to and from the information network centre.

6. A portable radio information terminal as claimed in claim 3 including a table having stored therein the correlation between the level of the residual capacity of the battery and the level of the received electrical field on the one hand and on the other hand the possibility/impossibility data of transmission/reception respectively in a tabulated form, and wherein the values of the residual levels of the battery capacity and the level of the received electrical field as detected by the first and the second detection means are collated to the table to verify the possibility/impossibility data for the transmission/reception to be verified.

7. A portable radio information terminal as claimed in claim 1 or claim 3 substantially as described herein with reference to the accompanying drawings.

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Application No: GB 9909448.4
Claims searched: 1 to 7

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4L LDGP, LDGX, LECX.

Int Cl (Ed.6): H04L 1/12, 1/16, 1/20, 12/28, 12/56; H04Q 7/22, 7/32.

Other: ONLINE - EPODOC, WPI.

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	US5826198	(MICROCOM) - Fig.2; Abstract	1,3
A	WO94/11999A2	(COMPAQ) - Abstract	1,3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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